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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/603,796	MOULI, CHANDRA
	Examiner	Art Unit
	Gregory V. Madden	2622

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 June 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30,32-35,39 and 40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30,32-35,39 and 40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 June 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed June 7, 2007 have been fully considered but they are not persuasive.

First, in regard to claims 1, 8, 30, 33, 34, 39, and 40, the Applicant argues that the Takayama reference (U.S. Pat. 6,683,643), which was relied upon by the Examiner to teach the storing of data corresponding to white reference images, does not in fact capture and store white reference images (See Remarks, Pgs. 14-15). However, the Examiner respectfully disagrees. Noting Col. 12, Line 53 – Col.13, Line 17, Takayama teaches that a white reference image (via test chart, etc.) is captured, and that "black flaws" are detected based upon previously-stored pixel threshold values. The defective pixels, or "black flaws", are then stored in memory 9 to be used to compensate actual image data captured later. A similar disclosure is made to the detection of "white flaws", where a dark current reference image is taken and "white flaw" defective pixels are also stored in memory 9 (See Col. 11, Line 47 – Col. 12, Line 8). In this respect, the Examiner believes that Takayama does teach that <u>data</u> (e.g. defective pixel address data) <u>corresponding to</u> at least one dark current reference image (dark image) and at least one white reference image (test chart image) is captured by a pixel array and stored in a storage unit. Thus, the Examiner believes that the combination of Harada in view of Bakhle further in view of Takayama does sufficiently teach the newly-amended subject matter of claims 1, 8, 30, 33, 34, 39, and 40, as will be set forth in further detail below.

Further, the Applicant argues that the Takayama reference does not store a plurality of gain conditions and exposure times associated with a dark current and white reference images (See Remarks, Pg. 15). The Examiner agrees that Takayama does not teach this aspect of the claim, but the Takayama reference was not relied upon to teach the storage of a plurality of gain conditions and exposure times in association with reference images. As noted in the previous office action, the Bakhle reference (U.S. Pat.

6,061,092) was relied upon to teach this limitation. Thus, as shown with claims 34 and 39 in the previous office action, the Examiner believes that the combination of Harada in view of Bakhle further in view of Takayama sufficiently teaches the storage of a plurality of gain conditions and exposure times in association with the references images. Please also note that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In regard to the remaining claims, the Applicant contends that claims 1, 8, 30, 33, 34, 39, and 40 are allowable over the cited references, and that the additionally cited references fail to overcome the deficiencies of the relied-upon references of the independent claims. However, as is noted above, the Examiner believes that Harada in view of Bakhle further in view of Takayama sufficiently teaches the elements of the independent claims, and thus the remaining claims also remain rejected, as will be set forth below.

Finally, the Examiner notes that the Applicant has cancelled claims 36 and 38, which had been previously objected under Double Patenting (37 C.F.R. 1.75) for being substantial duplicates of claims 30 and 33. As the claims are now canceled, the Double Patenting objection is hereby withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5, 8-13, 30, 32-34, 39, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harada (U.S. Pat. 7,133,072) in view of Bakhle et al. (U.S. Pat. 6,061,092) further in view of Takayama et al. (U.S. Pat. 6,683,643).

First, in regard to **claim 1**, the Harada reference teaches an image processing apparatus (engine 4) comprising a storage system for storing first data (sensed image data in memory 12) corresponding to at least one actual image and second data corresponding to at least one dark current reference image (stored in dark correction memory 23) captured by a pixel array (CMOS or CCD 1), and a processor (image correction circuit 5) coupled to the storage system for compensating the first data (sensed image data) using the second data (dark correction data), wherein the storage section stores a plurality of conditions (e.g. exposure time, amplifier gain, temperature) associated with the second data. Please refer 1, 2, and 6a, Col. 4, Line 58 – Col. 5, Line 63, and Col. 7, Line 17 – Col. 9, Line 13. What the Harada reference fails to specifically teach is that the storage system stores a plurality of gain conditions and a plurality of exposure times associated with the first data and a plurality of gain conditions and a plurality of exposure times associated with the second data. However, the Bakhle reference teaches that gain and exposure settings of the first image (scene image) are stored in a storage system (dark image cache 41), and gain and exposure settings of a second image (dark images) are also stored (Please refer to Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54). What both of the above references fail to teach is that the storage system stores data corresponding to both dark current reference images and white reference images. However, referring to the Takayama reference, Takayama teaches an apparatus wherein a pixel array (CCD 1) captures data from at least one white reference image (using white test chart), wherein respective second data (black flaw data) corresponding to the white reference image is stored in a storage system (memory 9) (See Fig. 14 and Col. 12, Line 53 – Col. 13, Line 17). Takayama further teaches that data corresponding to at least one dark current reference image (dark image) is also captured and stored, as shown in Col. 11, Line 47 – Col. 12, Line 8. It would have been obvious to one of

ordinary skill in the art at the time the invention was made to have incorporated the storing of gain and exposure time settings for the first and second data, as taught by Bakhle, with the compensation method of Harada, as well as to have incorporated the white reference images of Takayama with the storage of reference images based on gain and exposure time settings, as taught by Harada in view of Bakhle. One would have been motivated to do so because by using a cache of previously stored reference images to compensate for actual images, a reference image does not need to be captured for each actual image in order to correct for dark current noise, etc., thereby reducing the shutter operations and power constraints, as taught by Bakhle in Col. 3, Lines 44-50. Also, in regard to the Takayama reference, it is equally advantageous to detect defect pixels based on white reference images as it is to detect defect pixels based on dark reference images, as pixel defects detected in one method (i.e. using white reference images to detect "black flaws") may be missed in the other.

Considering **claim 2**, the limitations of claim 1 are set forth above, and the Bakhle reference further teaches that the processor performs compensation using the second data (dark image data), having an associated gain and exposure time that most closely matches the gain and exposure time associated with the first data, as is taught in Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54.

As for **claims 3**, the limitations of claim 2 are shown above, and Harada teaches that the processor (image correction circuit 5) performs both dark current and defective pixel compensation on the first data (sensed image data), as taught in Fig. 2 and Col. 4, Line 58 – Col. 5, Line 63.

Regarding **claim 4**, the limitations of claim 2 are set forth above, and the Bakhle reference further teaches that the pixel array (36) captures a plurality of dark current reference images (dark images) under a plurality of gain and exposure conditions, and the respective second data corresponding to the plurality of captured dark current reference images is stored along with the associated gain and exposure condition information (dark column reference data) for each dark current reference image in the storage system

(cache 41). Again, please refer to Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54.

Next, in regard to **claim 5**, the limitations of claim 2 are taught above by Harada in view of Bakhle further in view of Takayama, and the Bakhle reference teaches in Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54 that a plurality of reference images are captured under a plurality of gain and exposure conditions, and the respective second data corresponding to the plurality of reference images is stored along with the associated gain and exposure condition information (dark column reference data) for each reference image in the storage system (cache 41). What neither Harada nor Bakhle specifically discloses, though, is that the pixel array captures a plurality of white reference images, and the respective second data corresponding to the plurality of white reference images is stored in the storage system. However, referring to the Takayama reference, Takayama teaches an apparatus wherein a pixel array (CCD 1) captures a plurality of white reference images (using white test chart), wherein respective second data (black flaw data) corresponding to the white reference images is stored in a storage system (memory 9) (See Fig. 14 and Col. 12, Line 53 – Col. 13, Line 17).

Next, considering **claim 8**, the Harada reference teaches a method for pixel compensation, wherein the method comprises capturing, using a pixel array (CMOS or CCD 1), first data (dark correction data) corresponding to dark current reference images, storing reference data corresponding to the dark current reference image in a storage system (dark correction memory 23 within engine 4), capturing, using a pixel array (1), at least one actual image (sensed image data), and storing the second data corresponding to the actual image in the storage system (memory 12), and compensating the second data (sensed image data) using the reference data (dark correction data). Please refer 1, 2, and 6a, Col. 4, Line 58 – Col. 5, Line 63, and Col. 7, Line 17 – Col. 9, Line 13. While Harada does disclose that the storage section stores a plurality of conditions (e.g. exposure time, amplifier gain, temperature) associated with the first (reference) data, Harada fails to teach that that storage system stores a plurality of gain

conditions and a plurality of exposure times associated with both the first and second data. However, the Bakhle reference teaches that gain and exposure settings of the first image (scene image) are stored in a storage system (dark image cache 41), and gain and exposure settings of a second image (dark images) are also stored (Please refer to Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54). Further, what both of the above references fail to teach is that the storage system stores data corresponding to dark current reference images and white reference images. However, referring to the Takayama reference, Takayama teaches an apparatus wherein a pixel array (CCD 1) captures data from at least one white reference image (using white test chart), wherein respective second data (black flaw data) corresponding to the white reference image is stored in a storage system (memory 9) (See Fig. 14 and Col. 12, Line 53 – Col. 13, Line 17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the storing of gain and exposure time settings for the first and second data, as taught by Bakhle, with the compensation method of Harada, as well as to have incorporated the white reference images of Takayama with the storage of reference images based on gain and exposure time settings, as taught by Harada in view of Bakhle. One would have been motivated to do so because by using a cache of previously stored reference images to compensate for actual images, a reference image does not need to be captured for each actual image in order to correct for dark current noise, etc., thereby reducing the shutter operations and power constraints, as taught by Bakhle in Col. 3, Lines 44-50. Also, in regard to the Takayama reference, it is equally advantageous to detect defect pixels based on white reference images as it is to detect defect pixels based on dark reference images, as pixel defects detected in one method (i.e. using white reference images to detect "black flaws") may be missed in the other.

In regard to **claim 9**, the limitations of claim 8 are taught above, and the Bakhle reference teaches that the act of compensating is performed while the digital camera is in an idle state, as is taught in Col. 6, Lines 6-31.

As for **claim 10**, the limitations of claim 8 are shown above, and Harada also discloses that the act of compensating further comprises identifying pixels affected by dark current using the dark current reference data (stored in dark correction memory 23), compensating the second data at pixel locations using the reference data, and storing the compensated data in the storage system (12). Please refer to Figs. 1, 2, and 6a, Col. 4, Line 58 – Col. 5, Line 63, and Col. 7, Line 17 – Col. 9, Line 13.

Considering **claim 11,** the limitations of claim 8 are again taught above, and Harada also teaches that the method further comprises identifying pixels as defective pixels (in defect correction circuit 22) using the reference data, compensating the second data (data from dark correction circuit 21) at pixel locations using the reference data, and storing the compensated second data in the storage system (12). Again, please see Figs. 1, 2, and 6a, Col. 4, Line 58 – Col. 5, Line 63, and Col. 7, Line 17 – Col. 9, Line 13.

Regarding **claim 12**, the limitations of claim 8 are taught above, and the Bakhle reference teaches that gain and exposure settings of the first image (scene image) are stored in a storage system (dark image cache 41), and gain and exposure settings of a dark current reference image are also stored, wherein the gain and exposure time settings of the dark current reference images used in the compensation are those which most closely match the gain and exposure time settings of the first data (scene image) (Please refer to Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54).

Considering **claim 13**, the limitations of claim 8 are taught above by Harada in view of Bakhle, and the Bakhle reference teaches in Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54 that a plurality of reference images are captured under a plurality of gain and exposure conditions, and the respective second data corresponding to the plurality of reference images is stored along with the associated gain and exposure condition information (dark column reference data) for each reference image in the storage system (cache 41). What neither reference specifically discloses, though, is that the pixel array captures a plurality of white reference images wherein the locations of defective pixels

which need compensation are identified. However, referring to the Takayama reference, Takayama teaches an apparatus wherein a pixel array (CCD 1) captures a plurality of white reference images (using white test chart), wherein respective second data (black flaw data) corresponding to the white reference images is stored in a storage system (memory 9), thus identifying the locations of defective pixels that need compensation (See Fig. 14 and Col. 12, Line 53 – Col. 13, Line 17).

Next, in regard to **claim 30**, Harada teaches a digital camera system comprising an image sensor (1), a dark current and defect pixel compensation circuit (5) for compensating first data corresponding to an actual image (sensed image data), and an image processor (CDS/AGC 2) coupled to the dark current and defective pixel compensation circuit (5) for forwarding the first data from the image sensor (1) to the dark current and defective pixel compensation circuit, wherein the dark current and defective pixel compensation circuit (5) includes a storage system, coupled to a processor via a bus, for storing the first data (sensed image data) corresponding to the actual image and second data (dark correction data) corresponding to dark current reference images captured by the image sensor, wherein the storage section stores a plurality of conditions (e.g. exposure time, amplifier gain, temperature) associated with the second data. Please refer 1, 2, and 6a, Col. 4, Line 58 – Col. 5, Line 63, and Col. 7, Line 17 – Col. 9, Line 13. What the Harada reference fails to specifically teach is that the storage system stores a plurality of gain conditions and a plurality of exposure times associated with the first data and a plurality of gain conditions and a plurality of exposure times associated with the second data. However, the Bakhle reference teaches that gain and exposure settings of the first image (scene image) are stored in a storage system (dark image cache 41), and gain and exposure settings of a second image (dark images) are also stored (Please refer to Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54). Further, what both of the above references fail to teach is that the storage system stores data corresponding to dark current reference images and white reference images. However, referring to the Takayama reference, Takayama teaches an apparatus wherein a pixel array (CCD 1) captures data from at

least one white reference image (using white test chart), wherein respective second data (black flaw data) corresponding to the white reference image is stored in a storage system (memory 9) (See Fig. 14 and Col. 12, Line 53 – Col. 13, Line 17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the storing of gain and exposure time settings for the first and second data, as taught by Bakhle, with the compensation method of Harada, as well as to have incorporated the white reference images of Takayama with the storage of reference images based on gain and exposure time settings, as taught by Harada in view of Bakhle. One would have been motivated to do so because by using a cache of previously stored dark reference images to compensate for actual images, a dark reference image does not need to be captured for each actual image in order to correct for dark current noise, etc., thereby reducing the shutter operations and power constraints, as taught by Bakhle in Col. 3, Lines 44-50. Also, in regard to the Takayama reference, it is equally advantageous to detect defect pixels based on white reference images as it is to detect defect pixels based on dark reference images, as pixel defects detected in one method (i.e. using white reference images to detect "black flaws") may be missed in the other.

As for **claim 32**, and the Bakhle reference teaches that the storage system further comprises a memory device (dark image cache 41) coupled to at least one processor (image processing unit 42) via a bus (34), at least one non-volatile memory device (41) coupled to the processor (42) via a bus (34). Please refer to Fig. 2 and Col. 3, Lines 54 – Col. 4, Line 42.

Next, considering **claim 33**, Harada teaches a system comprising an imaging device (digital camera) comprising a storage system for storing first data (sensed image data) corresponding to at least one actual image and second data (dark correction data) corresponding to dark current reference images captured by a pixel array (CCD or CMOS 1), a processor (5) coupled to the storage system for compensating the data corresponding to the actual image. Please refer 1, 2, and 6a, Col. 4, Line 58 – Col. 5, Line 63, and Col. 7, Line 17 – Col. 9, Line 13. While Harada does disclose that the storage section

stores a plurality of conditions (e.g. exposure time, amplifier gain, temperature) associated with the first (reference) data, Harada fails to teach that that storage system stores a plurality of gain conditions and a plurality of exposure times associated with both the first and second data. Harada further fails to disclose that the system is a computer system comprising a first processor, a memory device coupled to the processor via a bus, and an input/output device coupled to the processor via the peripheral bus. However, the Bakhle reference teaches that gain and exposure settings of the first image (scene image) are stored in a storage system (dark image cache 41), and gain and exposure settings of a second image (dark images) are also stored (Please refer to Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54). Bakhle also teaches a first processor (image processing unit 42), a memory device (41) coupled to the processor via a bus (34), and an input/output device (video camera 30) coupled to the processor Further, what both of the above references fail to teach is that the storage system stores data corresponding to dark current reference images and white reference images. However, referring to the Takayama reference, Takayama teaches an apparatus wherein a pixel array (CCD 1) captures data from at least one white reference image (using white test chart), wherein respective second data (black flaw data) corresponding to the white reference image is stored in a storage system (memory 9) (See Fig. 14 and Col. 12, Line 53 – Col. 13, Line 17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the storing of gain and exposure time settings for the first and second data, as taught by Bakhle, with the compensation method of Harada, as well as to have incorporated the white reference images of Takayama with the storage of reference images based on gain and exposure time settings, as taught by Harada in view of Bakhle. One would have been motivated to do so because by using a cache of previously stored dark reference images to compensate for actual images, a dark reference image does not need to be captured for each actual image in order to correct for dark current noise, etc., thereby reducing the shutter operations and power constraints, as taught by Bakhle in Col. 3, Lines 44-50. Also, in regard to the Takayama reference, it is equally advantageous to detect

defect pixels based on white reference images as it is to detect defect pixels based on dark reference images, as pixel defects detected in one method (i.e. using white reference images to detect "black flaws") may be missed in the other.

In regard to **claim 34**, the Harada reference teaches an image processing apparatus (engine 4) comprising a storage system for storing first data (sensed image data in memory 12) corresponding to at least one actual image and second data corresponding to at least one dark current reference image (stored in dark correction memory 23) captured by a pixel array (CMOS or CCD 1), and a processor (image correction circuit 5) coupled to the storage system for compensating the first data (sensed image data) using the second data (dark correction data), wherein the storage section stores a plurality of conditions (e.g. exposure time, amplifier gain, temperature) associated with the second data. Please refer 1, 2, and 6a, Col. 4, Line 58 – Col. 5, Line 63, and Col. 7, Line 17 – Col. 9, Line 13. What the Harada reference fails to specifically teach is that the storage system stores a plurality of gain conditions and a plurality of exposure times associated with the first data and a plurality of gain conditions and a plurality of exposure times associated with the second data. However, the Bakhle reference teaches that gain and exposure settings of the first image (scene image) are stored in a storage system (dark image cache 41), and gain and exposure settings of a second image (dark images) are also stored (Please refer to Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54). What both of the above references fail to teach is that the storage system stores data corresponding to dark current reference images and white reference images. However, referring to the Takayama reference, Takayama teaches an apparatus wherein a pixel array (CCD 1) captures a plurality of white reference images (using white test chart), wherein respective second data (black flaw data) corresponding to the white reference images is stored in a storage system (memory 9) (See Fig. 14 and Col. 12, Line 53 – Col. 13, Line 17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the white reference images of Takayama with the storage of reference images based on gain and exposure

time settings, as taught by Harada in view of Bakhle. One would have been motivated to do so because it is equally advantageous to detect defect pixels based on white reference images as it is to detect defect pixels based on dark reference images, as pixel defects detected in one method may be missed in another.

In regard to **claim 39**, Harada teaches a dark current and defective pixel compensation circuit comprising a storage system for storing first data (sensed image data) corresponding to at least one actual image and second data (dark correction data) corresponding to dark current reference images captured by a pixel array (CCD or CMOS 1), a processor (5) coupled to the storage system for compensating the data corresponding to the actual image. Please refer 1, 2, and 6a, Col. 4, Line 58 – Col. 5, Line 63, and Col. 7, Line 17 – Col. 9, Line 13. While Harada does disclose that the storage section stores a plurality of conditions (e.g. exposure time, amplifier gain, temperature) associated with the first (reference) data, Harada fails to teach that that storage system stores a plurality of gain conditions and a plurality of exposure times associated with both the first and second data. Harada further fails to disclose that the circuit comprises a bus, wherein the storage system is coupled to the processor via the bus. However, the Bakhle reference teaches that gain and exposure settings of the first image (scene image) are stored in a storage system (dark image cache 41), and gain and exposure settings of a second image (dark images) are also stored (Please refer to Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54). Bakhle also teaches a processor (image processing unit 42) and a storage system (41) coupled to the processor via a bus (34). What both of the above references fail to teach is that the storage system stores data corresponding to dark current reference images and white reference images. However, referring to the Takayama reference, Takayama teaches an apparatus wherein a pixel array (CCD 1) captures a plurality of white reference images (using white test chart), wherein respective second data (black flaw data) corresponding to the white reference images is stored in a storage system (memory 9) (See Fig. 14 and Col. 12, Line 53 – Col. 13, Line 17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the white reference images of

Takayama with the storage of reference images based on gain and exposure time settings, as taught by Harada in view of Bakhle. One would have been motivated to do so because it is equally advantageous to detect defect pixels based on white reference images as it is to detect defect pixels based on dark reference images, as pixel defects detected in one method may be missed in another.

Finally, considering **claim 40**, Harada teaches an integrated circuit comprising a dark current and defect pixel compensation circuit (5) for compensating first data corresponding to an actual image (sensed image data), and an image processor (CDS/AGC 2) coupled to the dark current and defective pixel compensation circuit (5) for forwarding the first data from the image sensor (1) to the dark current and defective pixel compensation circuit, wherein the dark current and defective pixel compensation circuit (5) includes a storage system, coupled to a processor via a bus, for storing the first data (sensed image data) corresponding to the actual image and second data (dark correction data) corresponding to dark current reference images captured by the image sensor, wherein the storage section stores a plurality of conditions (e.g. exposure time, amplifier gain, temperature) associated with the second data. Please refer 1, 2, and 6a, Col. 4, Line 58 – Col. 5, Line 63, and Col. 7, Line 17 – Col. 9, Line 13. What the Harada reference fails to specifically teach is that the storage system stores a plurality of gain conditions and a plurality of exposure times associated with the first data and a plurality of gain conditions and a plurality of exposure times associated with the second data. However, the Bakhle reference teaches that gain and exposure settings of the first image (scene image) are stored in a storage system (dark image cache 41), and gain and exposure settings of a second image (dark images) are also stored (Please refer to Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54). Further, what both of the above references fail to teach is that the storage system stores data corresponding to dark current reference images and white reference images. However, referring to the Takayama reference, Takayama teaches an apparatus wherein a pixel array (CCD 1) captures data from at least one white reference image (using white test chart), wherein respective second data (black flaw data) corresponding to the white reference

image is stored in a storage system (memory 9) (See Fig. 14 and Col. 12, Line 53 – Col. 13, Line 17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the storing of gain and exposure time settings for the first and second data, as taught by Bakhle, with the compensation method of Harada, as well as to have incorporated the white reference images of Takayama with the storage of reference images based on gain and exposure time settings, as taught by Harada in view of Bakhle. One would have been motivated to do so because by using a cache of previously stored dark reference images to compensate for actual images, a dark reference image does not need to be captured for each actual image in order to correct for dark current noise, etc., thereby reducing the shutter operations and power constraints, as taught by Bakhle in Col. 3, Lines 44-50. Also, in regard to the Takayama reference, it is equally advantageous to detect defect pixels based on white reference images as it is to detect defect pixels based on dark reference images, as pixel defects detected in one method (i.e. using white reference images to detect "black flaws") may be missed in the other.

Claims 6, 7, 14, 15, 20-24, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harada (U.S. Pat. 7,133,072) in view of Bakhle et al. (U.S. Pat. 6,061,092) further in view of Takayama et al. (U.S. Pat. 6,683,643), still further in view of Houchin et al. (U.S. Pat. 5,047,861).

First, considering **claim 6**, the limitations of claim 5 are taught above, but neither the Harada nor the Bakhle nor the Takayama reference explicitly discloses that the plurality of white reference images are captured under a plurality of light conditions and that the second data corresponding to the white reference images is also stored together with an associated light condition. However, the Houchin reference teaches in Col. 8, Line 60 – Col. 9, Line 12 that a plurality of light conditions are used to capture reference images, and therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the reference images under different light conditions, as taught by Houchin, with the reference image capturing if Harada in view of Bakhle further

in view of Takayama. One would have been motivated to do so because the plurality of light conditions allows for a far more precise calibration of the reference images than simply two light conditions (e.g. full illumination and zero illumination), thus aiding in the detection of defective pixels under particular conditions.

In regard to **claim 7**, the limitations of claim 6 are set forth above, and the Houchin reference also shows that the plurality of light conditions comprise a no light condition, a first light condition, and a second light condition having a higher Lux value (illumination) than the first light condition. Please refer again to Col. 8, Line 60 – Col. 9, Line 12.

As for **claim 14**, the limitations of claim 8 are taught above, and as is similarly disclosed above with respect to claim 6, neither the Harada nor the Bakhle nor the Takayama reference explicitly discloses that the plurality of white reference images are captured under a plurality of light conditions and that the second data corresponding to the white reference images is also stored together with an associated light condition. However, the Houchin reference teaches in Col. 8, Line 60 – Col. 9, Line 12 that a plurality of light conditions are used to capture reference images, and therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the reference images under different light conditions, as taught by Houchin, with the reference image capturing if Harada in view of Bakhle further in view of Takayama.

Considering **claim 15**, the limitations of claim 14 are set forth above, and the Houchin reference also shows that the plurality of light conditions comprise a no light condition, a first light condition, and a second light condition having a higher Lux value (illumination) than the first light condition. Please refer again to Col. 8, Line 60 – Col. 9, Line 12.

In regard to **claim 20**, Harada in view of Bakhle further in view Takayama and still further in view of Houchin teaches the limitations of claim 14 above, and the Bakhle reference further teaches that the method further comprises selecting one of the reference data by selecting one of the plurality of gain

and exposure combinations based on the gain and exposure combination that most closely matches the gain and exposure combination of the second data, as is taught in Figs. 2-3, Col. 3, Line 40 – Col. 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54.

As for **claim 21**, the limitations of claim 20 are taught above, and Takayama also discloses that the method further comprises smoothing the pixels affected by dark current using signal values from available neighboring pixels, the pixels affected being identified using the selected reference data, the signal value of each pixel identified as affected by dark current being retrieved from the second data. Please refer to Col. 14, Lines 30-44 and Col. 15, Lines 5-9.

Regarding **claim 22**, the limitations of claim 21 are taught above, and again in Col. 14, Lines 30-44 and Col. 15, Lines 5-9, the Takayama reference teaches that the smoothing is accomplished by averaging the signal values of the neighboring pixels.

Considering **claim 23**, again the limitations of claim 20 are taught above, and the Takayama reference teaches that the method may further comprise scaling down the signal value of a pixel affected by dark current, the pixels affected being identified using selected reference data, the signal value of each pixel identified as affected by dark current being retrieved from the second data. See Col. 14, Lines 30-44.

In regard to **claim 24**, the limitations of claim 24 are taught above, and Takayama further teaches in Col. 14, Lines 30-44 that the scaling down is accomplished by multiplying the signal value by an average signal value for dark current and hot pixels at the selected gain and exposure combination and dividing by the signal value of the pixels to be compensated.

Finally, regarding **claim 35**, the Harada reference teaches that a storage system stores first data corresponding to an actual image and second data corresponding to a reference image captured by the pixel array, but Takayama fails to disclose that the storage system stores gain conditions and exposure times associated with both the first and second data, wherein the compensation using the second data

involves associating the gain and exposure time of the second data that most closely matches the gain and exposure time associated with the first data. However, the Bakhle reference teaches that gain and exposure settings of the first image (scene image) are stored in a storage system (dark image cache 41), and gain and exposure settings of a second image (dark images) are also stored, wherein the gain and exposure time settings of the second data (dark images) used in the compensation are those which most closely match the gain and exposure time settings of the first data (scene image) (Please refer to Figs. 2-3, Col. 3, Line 40 – Col 4, Line 32, and Col. 4, Line 66 – Col. 5, Line 54). What Harada and Bakhle further in view of Takayama both fail to disclose is that the storage system processor further stores light condition information for the second data, but the Houchin reference teaches in Col. 8, Line 60 – Col. 9, Line 12 that a plurality of light conditions are used to capture reference images, and therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the reference images under different light conditions, as taught by Houchin, with the reference image capturing of Harada in view of Bakhle further in view of Takayama. One would have been motivated to do so because the plurality of light conditions allows for a far more precise calibration of the reference images than simply two light conditions (e.g. full illumination and zero illumination), thus aiding in the detection of defective pixels under particular conditions.

Claims 16-19 and 25-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harada (U.S. Pat. 7,133,072) in view of Bakhle et al. (U.S. Pat. 6,061,092), further in view of Takayama et al. (U.S. Pat. 6,683,643), still further in view of Houchin et al. (U.S. Pat. 5,047,861), and still further in view of Baharav et al. (U.S. Pat. 6,737,625).

Considering **claims 16-19**, the limitations of claims 14 and 15 are taught above, but none of the Harada, Bakhle, Takayama, nor Houchin references specifically discloses that reference data is created for dark dead pixels, white dead pixels, saturation dead pixels, and bad pixels. However, as the Baharav

reference teaches in Col. 1, Lines 43-57, dark dead pixels, white dead pixels, saturation dead pixels, and bad pixels are all common forms of defective pixels, and therefore it would have been obvious to one of ordinary skill in the art to have incorporated the defective pixel compensation method of Harada in view of Bakhle, further in view of Takayama, still further in view of Houchin so as to compensate for dark dead pixels, white dead pixels, saturation dead pixels, and bad pixels. One would have been motivated to do so because correcting for defective pixels using all of the above reference data ensures the highest quality image possible under a variety of image-taking conditions.

Next, as for **claims 25-28**, the limitations of claims 16-19 are taught above, respectively, and while Harada in view of Bakhle, further in view of Takayama, still further in view of Houchin, and still further in view of Baharav does not expressly teach that the dead and bad pixels are scaled in various ways based on different light conditions, Official Notice is hereby taken that it would have been obvious to scale the different types of dead and bad pixels in different ways under different lighting conditions because each type of dead pixel is detected using such different lighting conditions, and thus by scaling the signal value up or down based on the specific type of dead pixel detected, each pixel can be effectively corrected to create an image having few defects. As the Applicant did not traverse the Official Notice presented in the previous office action, the above limitation is now considered to be admitted prior art.

Finally, regarding **claim 29**, the limitations of claim 28 are shown above, and while none of the reference directly discloses that the method of claim 28 further comprises color compensating bad pixels using a formula based on the number of defective colors for the bad pixels, Official Notice is hereby taken that color compensating bad pixels is well-known to those of ordinary skill in the art and would have been advantageous to one of ordinary skill in the art because color compensating bad pixels allows for defective pixels to be corrected to the specific color desired in the scene, as opposed to simply

correcting the luminance level of the pixel. As the Applicant did not traverse the Official Notice presented in the previous office action, the above limitation is now considered to be admitted prior art.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Kimura (U.S. Pat. 7,102,673): Note Fig. 2

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory V. Madden whose telephone number is 571-272-8128. The examiner can normally be reached on Mon.-Fri. 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ngoc Yen Vu can be reached on 571-272-7320. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Gregory Madden
July 18, 2007

NGOC-YEN VU
SUPERVISORY PATENT EXAMINER